were burned. In Ocean, Monmouth, Burlington and Cumberland Cos., the fires have been exceedingly destructive; over 18,000 acres of cedar and large tracks of vineyards have been destroyed. Observed from Pike's Peak, 5th, 11th, 12th, 13th, 14th, 16th, 17th, 24th. Colorado Springs, 15th, 24th. North Platte, 7th. Ft. Dodge, Ia., 1st, 3rd. Independence, Kan., 1st to 27th. Freehold, N. J., 6th, 9th, 10th, 12th, 15th, 16th, 17th. Atco, N. J., 6th, 12th. Walnut Grove, Va., 8th to 19th, 21st, 23rd.

*Polar Bands.*—Portland, Or., 12th, 17th; Riley, Ill., 14th; New Corydon, Ind., 1st, 6th, 11th, 13th, 14th, 23rd, 24th; Guttenburg, Ia., 20th; Clear Creek, Neb., 30th; Auburn, N. H., 29th; Walnut Grove, Va., 2nd.

*Earthquakes.*—Pt. San Jose, Cal., 5th, 11:35 p. m., slight shock. San Francisco, 5th, 11 p. m., sharp shocks in various parts of city; motion from south to north and then vertical. Newburyport, Mass., 12th, 7:45 a. m., violent shock, houses shook in many parts of the city, the accompanying noise resembling that of a heavy barrel rolling over a chamber floor. Shocks were felt at the same time in Haverhill, Groveland and surrounding towns. Billerica, Mass., 12th, slight shock at 7:30 a. m.

*Locusts.*—Morgantown, W. Va., 18th, first re-appearance of 17 year locusts. Their successive appearance at this station is reported as follows: May 15th, 1795; May 25th, 1812; May 25th, 1829; May 14th, 1846; May 25th, 1863; May 1[illegible]th, 1880. Cedar Vale, Kan., 23rd, distructive western locust in considerable numbers.

*Sun Spots.*—The following record of observations, made by Mr. D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent, Nautical Almanac Office, Washington, D. C.:

| Date—May, 1880. | No. of new— | | Disappeared by solar rotation. | | Reappeared by solar rotation. | | Total number visible. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | Groups | Spots. | Groups | Spots. | Groups | Spots. | Groups | Spots. | |
| 1st, 8 a. m... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 20† | Many of the spots small. |
| 2nd, 12 m..... | 1 | 5 | 0 | 0 | 1 | 5 | 2 | 20† | Faculæ. |
| 3rd, 8 a. m... | 0 | 5 | 0 | 5 | 0 | 5 | 2 | 20† | |
| 4th, 8 a. m... | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 17† | Faculæ. |
| 5th, 5 p. m... | 0 | 0 | 0 | 5 | 0 | 0 | 2 | 12 | Broad areas of faculæ. |
| 6th, 8 a. m... | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 10 | Faculæ. |
| 7th, 8 a. m.... | 1 | 4 | 0 | 0 | 0 | 0 | 2 | 14 | Faculæ. |
| 9th, 10 a. m... | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 12 | |
| 13th, 12 m..... | 0 | 0 | ..... | ..... | 0 | 0 | 1 | 2 | |
| 17th, 3 p. m... | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | |
| 18th, 6 p. m.... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 20th, 4 p. m | 1 | 7 | 0 | 0 | 0 | 0 | 1 | 7 | Spots small. |
| 21st, 4 p. m... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | Faculæ. |
| 24th, 8 p. m.... | 2 | 8 | ..... | ..... | 1 | 5 | 2 | 8 | Broad areas of faculæ. |
| 25th, 4 p. m... | 1 | 12 | 0 | 0 | 0 | 9 | 3 | 20† | Faculæ. Many of the spots small. |
| 26th, 5 p. m.... | 0 | 6 | 0 | 0 | 0 | 6 | 2 | 22† | Faculæ. Many of the spots small. |
| 27th, 4 p. m.... | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 25† | Faculæ. Many of the spots small. |
| 31st, 8 p. m... | 1 | 2 | 0 | 0 | 1 | 2 | 2 | 27† | Faculæ. Many of the spots small. |

†Approximated.

Mr. Wm. Dawson, at Spiceland, Indiana, reports:—1st, 3 groups, 60 spots. 2nd, 3 groups, 34 spots. 3rd, 3 groups, 22 spots. 5th, 3 groups, 30 spots. 6th, 2 groups, 17 spots. 7th, 3 groups, 28 spots. 8th, 2 groups, 24 spots. 12th, 3 groups, 11 spots. 13th, 2 groups, 11 spots. 14th, 2 groups, 4 spots. 15th and 17th, no spots. 16th, 1 group, 4 spots. 19th, 2 groups, 5 spots. 23rd, 1 group, 2 spots. 27th, 1 group, 40 spots. 28th, 1 group, 50 spots. 30th, 2 groups, 63 spots. 31st, 2 groups, 43 spots.

Mr. H. D. Gowey, at North Lewisburg, Ohio, reports:—26th, 8:30 a. m., two large and several small spots N. of equator and near E. side. 27th, 7:45 a. m., two large spots and several groups. 29th, 7:45 a. m., two very large and several groups of smaller spots.

Mr. F. Hess, at Fort Dodge, Ia., reports: 1st, six large spots, each accompanied by a number of smaller ones, and some faculæ on sun's upper half. 2nd, 6 a. m., same group in NW. quarter, and a new spot near E. limb. 3rd, 8 a. m., one large spot and faculæ in NE. quarter; only three spots of the other group remain distinctly visible. 4th, only one large spot—too windy and hazy for distinct vision. 5th, 8 a. m., one very large spot with broad penumbra and a cluster of very minute spots beneath in NE. quarter; also two small spots and many faculæ in NW. quarter. From the 6th to 13th, same group of one large and a cluster of small spots looking like a bunch of grapes suspended from penumbra of large spot, and some faculæ visible until 13th when the cluster consolidated into one large spot. 14th, no spots or faculæ. 15th and 16th, no spots, faculæ in SE. quarter. 17th and 18th, no spots or faculæ. 20th and 21st, two large and a number of smaller spots amid faculæ in NE. quarter, between 3′ to 5′ from NE. limb; at noon of the 21st only one spot about 8′ from NE. limb which had also disappeared by 6 p. m. 22nd and 23rd, no spots or faculæ. From the 25th to 31st, a fine group of twenty or more spots, of which five quite distinct and one very large, undergoing various changes while advancing on upper half of sun's disk. A new spot and group of faculæ appeared in SE. quarter on the 30th.

## NOTES AND EXTRACTS.

[*From Nature, April 8, 1880.*]

*On the Long Period Inequality in Rainfall.*[1]—1. If it be true that there is a variation in the power of the sun depending on the state of his surface, this variation might naturally be expected to make itself apparent through a corresponding change in the rainfall of the earth, so that when the sun is most powerful there ought to be the greatest rainfall.

2. While the connection indicated above is that which most readily occurs to the mind, yet the difficulty of ascertaining the facts of the case in a manner bearing the smallest approach to completeness, is so great as to be at present insuperable. There is, *first of all*, an intense reference to locality in rainfall, so that the rainfall at one place may differ greatly from that at another place in its near neighborhood. *Again*, there are, probably, in addition to possible secular inequalities, very great oscillations in the yearly rainfall at any one place, or accidental variations as we may term them, in our ignorance of their cause. *Thirdly*, it is in comparatively few places, and those places chosen not with the smallest reference to this particular problem, that we have anything like a trustworthy account of the rainfall throughout a considerable number of years. *Fourthly*, we have no information of any importance with respect to the rainfall at sea.

3. Besides the formidable catalogue of difficulties now mentioned, we ought to bear in mind the following considerations. The convection currents of the earth are regulated by two things, one of which is constant, while the other may be variable. The constant element is the velocity of rotation of the earth on its axis, while the element of possible variability is the power of the sun. Hence it follows that if the sun be variable it will cause a variation in the direction as well as in the intensity of the earth's convection-currents on the principle which tells us that the resultant of two forces, one constant and the other variable, must vary both in magnitude and direction. Now if it be true that we have a long period variation, not merely of the intensity, but also of the distribution of the earth's convection-currents, and if we bear in mind the intensely local reference in rainfall, it would be too much to expect that the rainfall inequality should exhibit the same years of maximum and minimum at all places. It is even conceivable that some places might exhibit a maximum when others showed a minimum, while others again might exhibit a double instead of a single period.

4. It appears to me that if we bear in mind these considerations, it will not answer to add together the rainfalls of a few selected stations as they stand, with the view of determining by this means whether there be a long-period inequality in the rainfall of the *whole earth*. We are not yet in a position to reply experimentally to this question. It does not, however, follow that nothing can be done. Dr. Meldrum and others appear to have achieved good preliminary work in the direction of indicating the existence of a rainfall inequality depending upon the state of the sun. Dr. Meldrum began by pointing out that in a good many places there is a greater rainfall during years of maximum than during years of minimum sun-spots, and that this phenomenon repeats itself from one solar cycle to another. Again, Governor Rawson has pointed out the existence of certain localities where the rainfall inequality appears to be of a precisely opposite character, while Dr. Hunter has shown the practical importance of the investigation with reference to certain tropical stations. The subject has likewise been discussed by Piazzi Smyth, Stone, and others.

1 By Balfour Stewart, LL.D., F.R.S., Professor of Natural Philosophy at the Owens College, Manchester. Being a paper read before the Lit. and Phil. Society of Manchester.

[*From Nature, May* 13, 1880.]

*The United States Weather Maps, August*, 1878.—The most remarkable feature of the meteorology of the northern hemisphere for August, 1878, as compared with July preceding, was the enormous change which took place in the distribution of atmospheric pressure over the Atlantic as far as lat. N. 60°, the change being greatest in the region around Ireland and the southwest of England, where it amounted to a fall of about the third of an inch. Pressure was also still further reduced over nearly the whole of the United States, particularly in the north, the deficiency from the normal at New York being over 0.150 inch. In Europe, this lowering of the pressure extended eastward into Russia as far as long. E. 40°, where it rose to nearly the average. It again fell on advancing further eastward to 0.150 inch below the normal in the valley of the Irtish, rising however again to the normal over the western affluents of the Lena. Thus from the Rocky Mountains, across the United States, the Atlantic, Europe and into Asia as far as the Lena, pressure was under the normal, in other words over a broad belt going half-way round the globe. This region of abnormally low pressure would appear to have stretched south-south-westward from Western Siberia, embracing the regions marked off by Syria, Egypt, Africa as far as Cape Colony, the Maritius, Western India and Turkistan. Also in Victoria, Tasmania and New Zeland pressure was very low, being at Dunedin 0.372 inch less than the normal.

In accordance with this distribution of pressure, temperature was from one to two degrees above the normal in the United States, except in the Northeast, where it fell to the average in the New England States, and fell still further to 1°.6 below it at St. John's, Newfoundland. Under the influence of the low pressure around Ireland the Weather Map shows a prevalence of strong breezes from the Atlantic over Western, Central, and Eastern Europe as far as Kiev, and over the whole of this wide region temperature was above the normal, most notably so over Great Britian and the south of Norway, the mean at Mandal being 4°.2 above the average.

Over England these Atlantic breezes were southwesterly, but in Scotland easterly. In England the month was one of the rainiest Augusts on record, and in the east of Scotland the rains were also unusually heavy. On the other hand, what invariably happens when the weather in the east of Scotland is characterised by rain and east winds, the weather of the West Highlands was dry and bright.

[*Popular Science Monthly and Comptes Rendus.*]

Observations made by M. Fautrat in France for four years as to the rain-fall over forests and over treeless tracts are as follows: That it rains more abundantly over forests than over open ground, especially when the trees are in leaf; that the air above the forest is more saturated with moisture than over the open

ground; that the leaves of trees intercept one-third, and in some trees one-half of the rain-fall, and that the leaves and branches restrain the evaporation of the water that reaches the ground, moistening the earth four times as much as it is moistened by the rain that falls on open ground. With respect to the kind of forest, M. Fautrat states that in 1878 the rain-fall collected above folious (leafy) trees was 30.5 inches and in the vicinity of the forest on the open ground 29.7 inches. The difference in the favor of the forest is 0.8 inches. During the same time there fell on the top of pines 30.5 inches of water and on the plain at the same altitude 28.6 inches, a difference in favor of pines of 1.9 inches. Forests, and above all, resinous woods have the remarkable property of extracting from the rain bearing currents that cross them a greater volume of rain-fall than open grounds.

[*La Nature.*]

*Winter of* 1879 *and* 1880, *at Clermont and Puy-de-Dome, France.*—M. Alluard, Director of the Observatory at Puy-de-Dome, presents some curious observations upon the comparison of temperatures at Clermont and at the summit of Puy-de-Dome. [The summit of Puy-de-dome is 3,540 feet above Clermont.] The winter of 1879 and 1880 was the most rigorous known in Auvergne. In the day-time a minimum temperature of —9.°4 was once experienced. The mean temperature of the month of December was +19.°9. While thick fog for days covered Clermont the weather at Puy-de-Dome remained very clear and the mean temperature was 18° higher at Puy-de-Dome than at Clermont. The inversion of temperatures between Clermont and Puy-de-Dome, previously remarked by M. Alluard, have been very frequent. They are shown whenever a zone of high pressure covers Europe, and the differences are greater as the pressures are higher. Thus a comparison of thermometers shows when an anti-cyclone is present in France or in Europe. It would be well to know at what height these inversions are first manifested.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

*Brigadier General, Chief Signal Officer, U. S. A.*

Copy furnished for

Entered at the Post Office at Washington, D. C., as Second-Class matter.